Fermi National Accelerator Laboratory

Technical Division
Headquarters

Device Data Management System

TD-2030

Janice Blanco — 10/17/00
Approved, TD Quality Assurance Officer — Date

[signature] — 10/17/00
Approved, Engineering & Fabrication Head — Date

[signature] — 10/18/00
Approved, Development & Test Head — Date

for Gregg Kalbfleisch — 10/19/00
Approved, Material Control Head — Date

[signature] — 10/19/00
Approved, Technical Division Head — Date

Revision History

Version	Date	Section No.	Specifics
1	10/16/2000	All	First version

Controlled Distribution

Technical Division Library

Introduction

Considering that a device lifetime is more than 20 years, and due to the volume of devices that pass through the division, it is necessary to institute a formal mechanism to track the history of devices. The purpose of this system is to manage information regarding uninstalled devices, and the scope of this system is all accelerator devices while they are under the control of the Technical Division.

It is essential to maintain detailed documentation of all accelerator components, from the early design stage, to all the fabrication and testing processes, continuing through the final installation and operation, and then as repairs or upgrades are completed (installation and operational information is gathered and maintained by Beams Division). Part of the work that we do must include "paper work". Proper records must be maintained in order to hold on to our institutional memory. Our focus should be to maintain records such that we can rather easily understand the work that was done 10+ years down the road.

When a device is assigned to the Technical Division we strive to maintain records with a high level of detail. When it is assigned to other divisions, we include a lower level of detail that is consistent with carrying out our mission. This document is meant to describe the high level of detail by enumerating the various "states" that a device can be in.

To this end, we have defined our "Device Data Management System".

The system is the result of the efforts of the following people:

Jamie Blowers	John Carson	Hank Glass	Ray Hanft	Dave Harding
Bob Jensen	Jim Rife	Terry Skweres	Brian Smith	Dan Smith

1.0 Methodology

Our methodology for defining this system was to begin by defining the various "states" that a device could reside within. By state, we mean the condition that a device can be in at any given time, e.g. "Ready to Use", "Awaiting In-Process", et cetera. After defining the states we then defined the inputs and outputs for each state (e.g. data) and who is responsible for each step (e.g. who gathers the data and who makes the next decision based on the data).

The result is a picture that we have called the "Device State Diagram", a.k.a. "spider diagram". Linked to the diagram are the details that define each state.

This document is our method to formally issue and institutionalize this data management system. It is meant to describe the system, and is not intended to be a work instruction that describes every detail of the process. This document can be used as a reference tool to aid the user in making the appropriate decisions as a device travels around the division. A work instruction for the system has been written, and it is entitled "OnBase: Device Service Record Procedure". Both documents are maintained in the device data management system.

This system is meant to evolve as the need arises. Please contact the TD Quality Assurance Manager with feedback on this system, and with any ideas on how to make it better.

2.0 Mechanics

In this day and age the tool of choice for managing data of any sort is a relational database. Our team decided that we should follow suit, and so we have built our system around an off-the-shelf document management system called "OnBase" (Hyland Software). This software is an electronic document management system that uses Microsoft SQL Server as a backbone. With the combination of using Microsoft Word (used to track the history of the device, log book fashion), and the "meta-data" keywords stored in the SQL database (used to store the current status of the device), we have developed a system which is capable of storing and reporting the appropriate device data. With the addition of the web module, this information can be accessed from anywhere in the world.

2.1 Device Service Records

Device Service Records (DSR) are used to record the history of each device. By service, we mean any action that is done on or to the device. It is made in a log-book fashion, where each entry is completed in chronological sequence, including the date and the name of the person supplying the information (not necessarily the recorder). The entries in the DSR are not intended to provide every detail of the work performed, but they are intended to describe the actions that have taken place

to the device. They should be written so that someone 10 years from now is able to understand what happened.

There are two types of DSRs, one for superconducting devices and another for conventional devices.

Here is an example:

TD/Engineering & Fabrication Specification # 5520-FM-333428
February 2, 2000
Rev. None

Device Service Record Form for TSFR117

Date	Comments (Include the following in each DSR entry: What, Where, Why)	Info Provided By
3/99	TSF117, at MSB, is of status "Ready to Use". [Estimated date shown.]	Ray Hanft
2/11/00	Magnet shown in MSB from Material Control MSB Inventory. Approved high quality spare.	Terry Skweres
7/29/00	Correction Stack upgrade and Recooler Upgrade completed. Travelers Closed.	Denny Gaw
7/31/00	This magnet has been retrofit with a recooler in the 2 phase system according to print ME-291300 and following the methodology developed from the prototype recooled spool TSFR124. Documentation of the recooler work is in an E&F notebook currently maintained in IB2 by Dean Sorensen. This magnet also had the correction coil lead stack modification performed to traveler TR-333403 and print MB-351860. This magnet has passed all leak checks and electrical tests pertaining to the upgrades performed. This magnet was moved to IB1 for testing. The device series designator has been changed from TSF to TSFR.	Brian Smith
8/14/00	Alignment of correctors to spool frame completed in IB1 using single stretched wire system.	Joe DiMarco
8/14/00	This device is given the status of "Ready to Use".	Ray Hanft
9/28/00	Verified Magnet at MSB.	Bob Jensen

2.2 Keywords

Keywords are used to identify the current condition of each device. The data stored as keywords are stored in the SQL database, and so they are in a structured format (the DSR is unstructured). This structured format allows us to generate reports from the data upon which we can base work decisions. These reports can include the history of the keywords, i.e. who, what and when the keywords were changed.

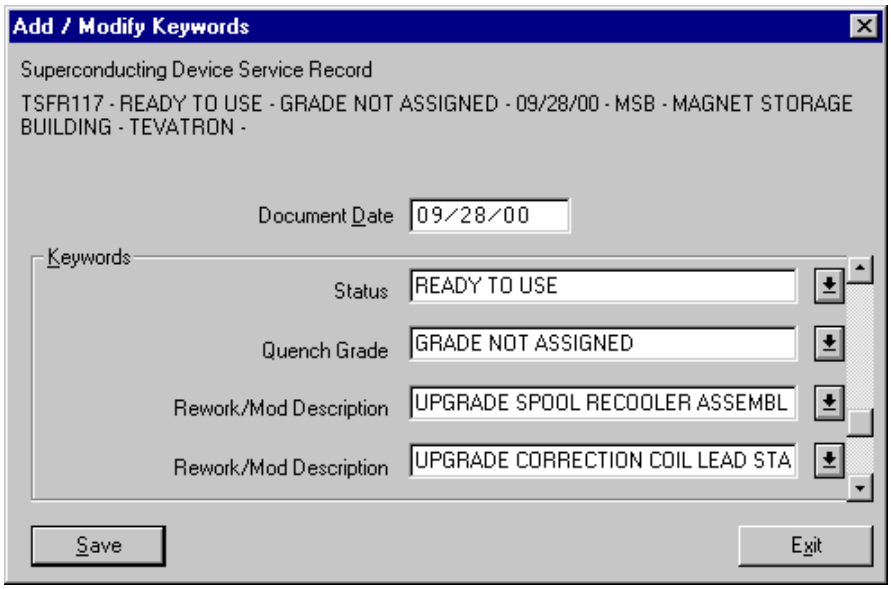
Because the keywords are searchable, it is very important to enter the information in a consistent manner. Correct spelling is essential, and the use of the correct names for items will make searching easier, e.g. using "correction coil lead stack" as opposed to "birthday cake". Pull-down menus should be used as much as possible to help with this.

The following are the keywords that are currently in use:

Project - The project that the device is used in, e.g. Tevatron, Main Injector.
Magnet Series - The prefix for the device, e.g. N23, TB.
Serial No. - The current serial number that the device is known by, e.g. TB1222.
AKA Serial No. - Any previous serial numbers that the device was known by.
Location - The last known location for the device, e.g. IB2, MSB, Tunnel.
Location Date - The date when the Location was last confirmed.
Status - The last known status for the device, e.g. Ready to Use, Needs Repair: Easy, Awaiting E&F Completion: Scheduled (see section 5 for details).
Status Date - The date when the Status was last confirmed.
Rework/Mod Description - A brief description of the modification, including ER/ECO numbers.
Specification No. - The controlled document number for the DSR form.
Specification Revision - Revision level for the DSR form.
Quench Grade - A grade assigned (only for superconducting devices) which rates the device for its quench performance.

All applicable keywords are filled in and updated as the device status and/or location changes.

Here is an example of the keywords:



3.0 Mindset

The majority of our work on devices is mechanical in nature. And since there is usually more mechanical work to be done than there is time in the day, it is easy to get ourselves into a mindset of thinking that the paperwork is not important or that we can take care of it

"after the fact". This mindset has proven to be very troublesome when it comes to figuring out what we did in the past, as well as figuring out where we stand today. In order to begin to maintain adequate quality records we must change our mindsets. *We must view the work of maintaining records as important as the physical construction or repair of the device, and that the work of maintaining our records will make our future work easier.* Until we begin the work of changing our minds, this system will not function to its potential.

4.0 Structure

The overall structure is defined in the Device State Diagram (last page). This diagram defines the various states that a device can be in at any time during its life. Each rectangle represents an action that is done to a device. Each oval represents a queue, i.e. waiting to have something done to it. A black bubble on a rectangle signifies that there is an assessment to be made in that activity.

It should also be noted that the lines connecting the various states are not the only ways that a device can move from one state to another. They are the "normal" ways, when operating under "normal" conditions. Due to the dynamic nature of the work at Fermilab, it is possible for a device to jump from any state to any other state.

As a device moves from state to state, comments are written in the DSR, and the keywords are updated appropriately. A rule of thumb is that a change to the keywords requires a comment in the DSR, but a comment in the DSR may not necessitate a keyword change. For example, if a device is moved from IB2 to MSB, then the location and date keywords are changed, and a comment is written in the DSR. But if a device only has a test completed on it, then a comment is written in the DSR, but the keywords may not change.

5.0 Status Details

For the purposes of this system we have defined status as "the reason that a device is in its particular state". With two exceptions (Drawings, Kits, & Travelers; Under Assessment), every state has one or more possible statuses. We have made the distinction between a state and a status because devices can be in a particular state for many reasons. An example is that a device can be in the state "Awaiting In Process", but it's status could be "Needs Repair: Easy", "Needs Repair: Hard", "Awaiting E&F Completion: Scheduled", et cetera.

Definitions for each status are as follows:

Installed - A device with this status is known to be installed in the accelerator complex.
Corresponding state: In Use

Ready to Use - A device with this status is available to be used in the accelerator complex. It has been dispositioned by a proper authority and is believed to be able to function properly in it's designated function.
Corresponding state: Ready to Use

Needs Evaluation: Recently Deinstalled - A device with this status has been removed from the accelerator complex and is in need of an evaluation to determine it's proper status, and whether or not it needs to be worked on.
Corresponding state: Awaiting Assessment

Needs Evaluation: E&F Work Complete - A device with this status needs to be evaluated because the assembly, repair, or upgrade work is complete. A proper authority needs to determine what the disposition or next work activity is.
Corresponding state: Awaiting Assessment

Needs Evaluation: D&T Work Complete - A device with this status needs to be evaluated because the Magnet Test Facility work is complete. A proper authority needs to determine what the disposition or next work activity is.
Corresponding state: Awaiting Assessment

Needs Evaluation: Special Reassessment - This status is meant to be a "catch-all" status for all other devices that need to be evaluated, but do not fit into the previous categories.
Corresponding states: Awaiting Assessment, In Process - Inactive, Receive from Other

Needs Repair: Easy - A device with this status has been evaluated by TD personnel and has been determined that a repair is required to make it function properly, and that the repair should be "easy". Devices may have this status for a long time, depending on the priorities of work and the desired "good spares" inventory.
Corresponding state: Awaiting In Process

Needs Repair: Hard - A device with this status has been evaluated by TD personnel and has been determined that a repair is required to make it function properly, and that the repair should be "hard". Devices may have this status for a long time, depending on the priorities of work and the desired "good spares" inventory.
Corresponding state: Awaiting In Process

Needs Repair: Very Hard - A device with this status has been evaluated by TD personnel and has been determined that a repair is required to make it function properly, and that the repair should be "very hard". Devices may have this status for a long time, depending on the priorities of work and the desired "good spares" inventory.
Corresponding state: Awaiting In Process

Needs Repair: Unknown Difficulty - A device with this status may or may not have been evaluated by TD personnel. It has been determined that a repair is required to make it function properly and the repair difficulty is unknown. Devices may have this status for a long time, depending on the priorities of work and the desired "good spares" inventory.

Corresponding state: Awaiting In Process

Needs Repair: Autopsy - A device with this status has been evaluated by TD personnel, and it has been determined that a very detailed and thorough investigation is required to understand the fault of the device. For devices in this status the work to determine the cause of the failure may destroy the device. Devices may have this status for a long time, depending on the priorities of work and the desired "good spares" inventory.
Corresponding state: Awaiting In Process

Awaiting E&F Completion: Scheduled - A device with this status is in need of work by E&F, and it has been place on the job list of active projects for production. Devices should not stay in this status for very long.
Corresponding states: Awaiting In Process, In Process - Inactive

Awaiting E&F Completion: In Process - A device with this status is being worked on by E&F. The status of the work is tracked with the E&F job list. Devices should not stay in this status for very long.
Corresponding states: In Process, In Process - Inactive

Awaiting D&T Completion: Not Scheduled - A device with this status is in need of testing at MTF, but it has not been put on the active schedule. Devices should not stay in this status for very long.
Corresponding state: Awaiting Test

Awaiting D&T Completion: Scheduled - A device with this status is in need of testing at MTF and it has been placed on the active schedule. Devices should not stay in this status for very long.
Corresponding state: Awaiting Test

Awaiting D&T Completion: In Process - A device with this status is being worked on by D&T. The status is tracked with the MTF Test Schedule. Devices should not stay in this status for very long.
Corresponding state: Under Test

Reserved: D&T - A device with this status is reserved for use at MTF (e.g. a reference device). The device is normally a good, functioning device, but it is not part of the "spares pool" (although it could be, if needed).
Corresponding state: In Use

Reserved: Onsite - A device with this status is still "on the FNAL books", but it is not in use in the accelerator complex.
Corresponding state: In Use

Reserved: Offsite - A device with this status has been sent to another customer (e.g. CERN).

Corresponding states: Ready to Ship to Other, Ship to Other

Reserved: Other - This status is meant to be a "catch-all" status for all other devices that are reserved but do not fit into the previous categories.
Corresponding state: In Use

Awaiting Salvage - A device with this status has been dispositioned to be scrapped but is waiting to have the useful parts removed from it.
Corresponding states: Awaiting Salvage, Salvage, Awaiting Scrap

Scrapped - A device with this status has been removed from circulation and scrapped.
Corresponding state: Scrapped

Never Built - A device with this status was never built. This status is meant to be a book-keeping aid so that we identify and document that a device by this serial number was never built (and so we should not be wondering why we cannot find the device). For example, some serial numbers were designated for specific devices, but those devices may have ended up being skipped during fabrication.
Corresponding state: there is no state for this status

6.0 State Details

For the purposes of this system we have defined state as "the condition that a device can be in at any time." The following describe the details for each state in the diagram. They are meant to cover the principles that are applied in each state, and may not cover every detail involved. We still need to rely on the insight and experience of our employees to complete all the details involved.

6.1 Drawings, Kits, and Travelers

Remarks:

- Drawings are created, approved and issued for use.
- Quality Control Travelers are created/revised to reflect the approved drawings and current fabrication practices (NOTE: Some work on devices is done without the use of QCTs).
- Parts kits are created/revised to reflect the approved drawings.

Inputs:

- An approved design for a device, as evidenced by the approved drawings

Outputs:

- Approved drawings, QCT's, and kit lists

Roles:

- **Designer/Drafter** - creates/edits the drawing(s) for the device

- **Drawing Approver(s)** - approves the drawing(s) for use
- **Process Engineer** - translates the drawing(s) into QCT(s)
- **QCT Approver(s)** - approves the QCT(s) for use
- **Parts kit generator** - generates a parts kit from the materials listed on the drawing(s)

Possible Statuses:

- No status given - this is a logical state, not an actual state.

6.2 Awaiting In Process

Remarks:

- Device is waiting to be worked on.
- Device is put into this queue after an assessment has been completed and an initial work order has been documented.
- Device can be waiting for resources, e.g. people, parts, scheduling.
- Devices need to be assigned a priority.

Inputs:

- A device
- Information regarding the device (e.g. relevant history, etc.)
- Work Order (includes at least a tentative work plan)
- Approved QCT's and drawings

Possible Statuses:

- Needs Repair: Easy
- Needs Repair: Hard
- Needs Repair: Very Hard
- Needs Repair: Unknown Difficulty
- Needs Repair: Autopsy
- Awaiting E&F Completion: Scheduled

6.3 In Process

Remarks:

- Invasive work is done to the device.
- Information is gathered regarding the device (e.g. what failed in the device, what work was done to the device, how was the device changed as a result of the work).
- A summary report is initiated (narrative describing what was done and what was learned from doing the work).

- Information analyzed.
- The device is dispositioned appropriately.

Inputs:

- A device
- Information regarding the device (e.g. relevant history, etc.)
- Work Order (includes at least a tentative work plan)

Outputs:

- Records of work completed on the device
- Updated Device Service Record (to be done by whomever is responsible for the work on the device)

Roles:

- **Worker** - works on the device, and adds to the history of the device
- **Record generator** - translates the information gathered regarding the device into a format that can be easily understood (both structured and unstructured)
- **Work reviewer** - reviews the work done on the device for adequacy and completeness
- **Record reviewer** - reviews the records for adequacy and completeness
- **Decision maker** - makes decisions about the device based on the information gathered

Possible Statuses:

- Awaiting E&F Completion: In Process

6.4 In Process - Inactive

Remarks:

- Device is waiting to be worked on.
- Device is put into this queue after work has been done on the device (i.e. it has been in "In Process - active").
- Device may be put into this queue due to changing priorities (e.g. a rush/emergency job will need to be completed first, and so the device must wait).
- Device can be waiting for resources, e.g. people, parts, scheduling.

Inputs:

- A device
- Information regarding the device (e.g. relevant history, etc.)
- Work Order (includes at least a tentative work plan)

Possible Statuses:

- Awaiting E&F Completion: In Process
- Awaiting E&F Completion: Scheduled
- Needs Evaluation: Special Reassessment

6.5 Awaiting Assessment

Remarks:

- Device comes into our purview:
  - Could be a potentially failed device from the Beams Division;
  - Could be a device from "In Process" which needs to be assessed before more work can be done.
- Device is waiting to be looked at (e.g. inspected) and for the appropriate information to be gathered (i.e. "Tree-shaking").

Inputs:

- A device
- If the device is coming from "In Process", then the details of what to look for during the assessment are defined

Possible Statuses:

- Needs Evaluation: Recently Deinstalled
- Needs Evaluation: E&F Work Complete
- Needs Evaluation: D&T Work Complete
- Needs Evaluation: Special Reassessment

6.6 Under Assessment

Remarks:

- Device comes into our purview.
- Information is gathered:
  - History of the device;
  - Reason stated for it needing work (e.g. why was it pulled from the tunnel);
  - Non-invasive testing (e.g. electrical/leak test, survey with flashlight/mirrors).
- Information is analyzed.

Inputs:

- A device
- Information regarding the device

Outputs:

- Records of work done on the device (including test results)
- Updated Device Service Record (to be done by whomever is responsible for the work on the device)
- A disposition and/or a work order:
    - Disposition may be that it is "Ready to Use", E&F work is required, or that D&T work is required (E&F and D&T work should be defined on a work order)
    - E&F work that does not effect device performance (i.e. magnetic or quench performance) does not normally warrant D&T work, but when E&F work does effect performance then D&T work should be done.
    - If D&T work is not done, then normally TD can disposition the device as "Ready to Use". If D&T work is done, then normally the customer can disposition the device as "Ready to Use".

Roles:

- **Tree shaker** - this person is responsible for gathering and organizing the pertinent information regarding the device (e.g. history, stated reason for being brought to TD, etc.)
- **Decision maker** - makes decisions about the device based on the information gathered

Possible Statuses:

- No status - this is a logical state, not an actual state.

6.7 Awaiting Test

Remarks:

- Device can be waiting for test facility equipment and personnel.
- Devices need to be assigned a priority.
- Need to determine what work needs to be done to the device, and what data needs to be gathered.
- Define who is responsible for gathering the data.

Inputs:

- Measurement request - can be detailed or very lax
    - Who wants the information?
    - What information is wanted?

- A device
  - The device may need some preparation which cannot be done by D&T, e.g. beam pipe removal, special water fittings, special purpose power supply.
- Who is responsible for planning the work?
- Who is responsible for making sure the work gets done and information gets back to the requester?
- Who is responsible for making decisions about the device (based on information gathered)?

Possible Statuses:

- Awaiting D&T Completion: Not Scheduled
- Awaiting D&T Completion: Scheduled

6.8 Under Test

Remarks:

- Device is tested.
- Information is gathered.
- Information is analyzed.
- Information is reported to the requester in a timely manner.
- Need to ensure that information is reported in a format that is appropriate for making decisions.

Inputs:

- A device
- Test facility resources
- Work plan (usually generated by joint effort of customer and the MTF test coordinator)

Outputs:

- Records of work done on the device
- Updated Device Service Record (to be done by whomever is responsible for the work on the device)
- Either one of the following:
  1. A disposition of "Ready To Use" (only if the appropriate authority, i.e. Decision Maker, has reviewed the test results)
  2. A request to the appropriate authority, i.e. Decision Maker, to review the test results and disposition the device

Roles:

- **Requester** - makes the request to MTF for information about a device

- **Coordinator** - coordinates the work to be done to the device
  - *Planner(s)* - makes work plan (usually with the customer)
  - *Preparer(s)* - prepares for the work
  - *Measurer(s)* - take the measurements of the device
  - *Analyzer(s)* - analyzes the information gathered, may include developing the analysis tools
- **Decision maker** - makes decisions about the device based on the information gathered

Possible Statuses:

- Awaiting D&T Completion: In Process

6.9 Ready to Use

Remarks:

- A device has been fabricated or repaired/reworked and has been approved for use.
- Devices in this state can be in storage in the Technical Division or in storage in the Beams Division (TD is only actively tracking the devices that we maintain within the Division - it is the responsibility of the BD to track the devices that they are storing in their areas).

Inputs:

- An approved device
- Fabrication or repair/rework records
- Updated Device Service Record

Roles:

- **Process Engineer** - scans and indexes (in Onbase) the records for the device
- **Record generator** - updates the device records appropriately (e.g. storage location, work done, etc.)

Possible Statuses:

- Ready To Use

6.10 In Use

Remarks:

- A device in this state is being used by the Beams Division (or possible Particle Physics Division), either in a tunnel or in a beamline.
- These devices are under the control of the Beams Division (or PPD).

Inputs:

- An approved device

Outputs:

- Records that define the reason that the device was uninstalled, e.g. needs repair, device replaced - still a good device, et cetera
- Updated Device Service Record (to be done by whomever is responsible for receiving the device)

Possible Statuses:

- Installed
- Reserved: Onsite
- Reserved: D&T
- Reserved: Other

6.11 Receive from Other

Remarks:

- A device is received from a customer outside of Fermilab (e.g. Los Alamos, Brookhaven).

Inputs:

- A device
- Information regarding the device (e.g. relevant history, details regarding the expected work - as defined by the customer, etc.)

Outputs:

- Updated Device Service Record (to be done by Process Engineering)

Roles:

- **Process Engineer** - adds/updates the Technical Division's records appropriately for the device

Possible Statuses:

- Needs Evaluation: Special Reassessment

6.12 Ready to Ship to Other

Remarks:

- This queue is for when a device has been fabricated for a customer outside of Fermilab (e.g. Los Alamos, CERN).

- The device is fabricated and tested appropriately and the appropriate authority has approved the device for shipment.
- The device must be packaged appropriately to ensure its functionality, reliability, and safety during transit.

Inputs:
- An approved device
- Information regarding the device which is to be sent with the device (e.g. fabrication records)
- Shipping instructions

Roles:
- **Worker** - appropriately packages the device for shipment, ensuring that the proper records are included
- **Record generator** - updates the records appropriately for the shipped device

Possible Statuses:
- Reserved: Offsite

6.13 Ship to Other

Remarks:
- A device has been fabricated for a customer outside of Fermilab (e.g. Los Alamos, CERN).

Inputs:
- An approved and properly packaged device
- Information regarding the device which is to be sent with the device (e.g. fabrication records)
- Shipping instructions

Outputs:
- Updated DSR (to be done by whomever is responsible for the shipment of the device)

Roles:
- **Worker** - follows the appropriate shipping procedures and ships the device to the customer
- **Record generator** - updates the records appropriately for the shipped device

Possible Statuses:
- Reserved: Offsite

6.14 Awaiting Salvage

Remarks:

- A complete device or device components have been dispositioned for salvage.
    - This disposition requires the approval of the device owner and Property Management.
- The materials are awaiting to be properly salvaged.

Inputs:

- Part(s) that have been dispositioned for salvage
- A record that shows what components are to be salvaged, and what inspections are to be done (if any)

Possible Statuses:

- Awaiting Salvage

6.15 Salvage

Remarks:

- A complete device or device components have been dispositioned for salvage.
- The appropriate components are removed from the device.
- The salvaged components are cleaned up and made ready to be used.
- The salvaged components may be tested to ensure that they are still adequate for use.
- Records for the device are updated appropriately.

Inputs:

- Part(s) that have been dispositioned for salvage
- A record that shows what components are to be salvaged, and what inspections are to be done (if any)

Outputs:

- Records of the components that were actually salvaged
- Updated Device Service Record (to be done by whomever is responsible for the work on the device)

Roles:

- **Worker** - this person is responsible for appropriately salvaging and cleaning the parts
- **Inspector** - Inspects the salvaged parts appropriately
- **Record generator** - updates the records appropriately for the salvaged parts

Possible Statuses:

- Awaiting Salvage

6.16 Scrap

Remarks:

- A complete device or device components have been dispositioned for scrap.
- The materials are disposed of according to the appropriate procedures, e.g. ES&H procedures, business practice.
- Records for the device are updated appropriately.

Inputs:

- Part(s) that have been dispositioned for scrap

Outputs:

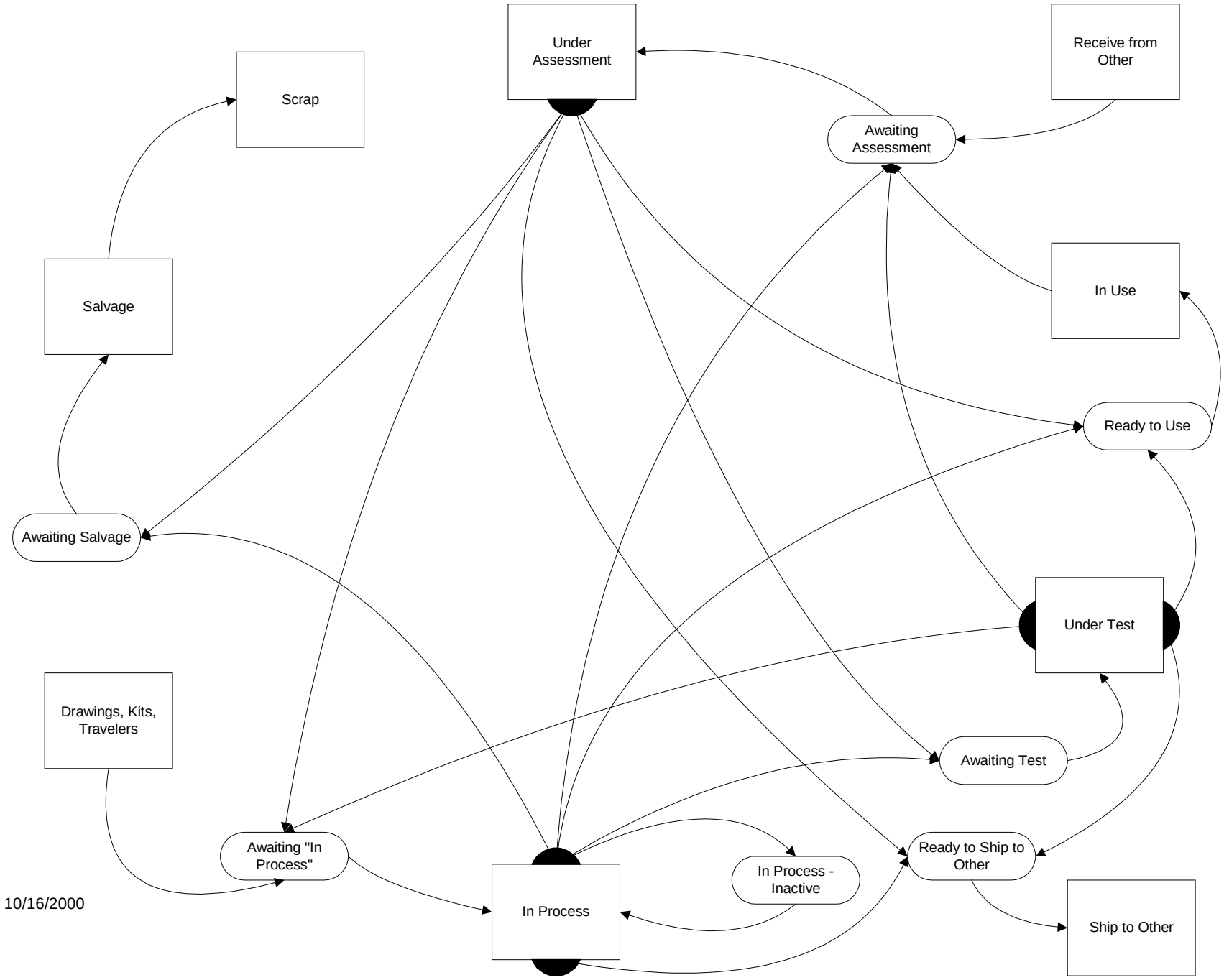
- Updated Device Service Record (to be done by whomever is responsible for scrapping on the device)

Roles:

- **Waste coordinator** - ensures that the materials are disposed of according to the appropriate procedures
- **Worker** - this person is responsible for appropriately disposing of the parts
- **Record generator** - updates the records appropriately for the scrapped parts

Possible Statuses:

- Scrapped



Device State Diagram

IB1 Flow of Devices and Data

	What's happening to the device:	Who is responsible for the DSR update for this step:	Keywords to be updated:	Typical keyword values:	Information expected in DSR:	Typical DSR statements:	Other DSR statements:
1.	***Device is "chosen" to be measured*** . Device chosen because of new construction, repair/upgrade, or due to special needs.	A Technician, if the measurement is part of a normal production process, otherwise a Physicist.	Status	"Awaiting D&T Completion: not scheduled"	The reason that this device is being measured.	"H8121D has arrived in IB1 from MSB. This magnet is to be quench tested in order to confirm or deny the existing quench data which indicate this quadrupole is unsuitable for use in the Tevatron, according to plan…provided by Ray Hanft."	"H8121D is to be quench tested in order to confirm or deny the existing quench data which indicate this quadrupole is unsuitable for use in the Tevatron" or "TSDR128 is to be aligned after being upgraded with a recooler."
2.	***Device arrives at IB1*** .	Material Control, if moved by them. Technician if not moved by MC.	Location	"IB1"	Where the device was moved from and to.		"TSDR128 was moved from IB2 to IB1."
3.	***Device placed on test stand*** .	Technician	Status	"Awaiting D&T Completion: scheduled"	The device was mounted on the test stand - only if there is a time delay between mounting and the testing.		"H8121D has been mounted on test stand 2, but the test will not start for another week due to liquid helium resource issues."
4.	***Measurement plan defined*** . This may be a "special" plan for a small number of magnets, or it may be defined as part of the normal production process. The plan needs to be defined before the testing can begin.	A Technician, if the measurement is part of a normal production process, otherwise a Physicist.	N/A	N/A	What measurement(s) is expected to be done.		
5.	***Testing started*** .	Technician	Status	"Awaiting D&T Completion: in process"	The device testing has started only if this will be a prolonged test.		"The point scan and single stretched wire measurements of ILP001 have started."
6.	***Testing finished*** .	Technician	Status	"Needs Evaluation D&T: work complete"	The device testing has finished - only if there is a time delay for analysis and disposition.	"The quench data for H8121D have been analyzed and it has been determined that this magnet has excellent quench performance. This device is now 'Ready to Use'. This device is being moved from IB1 to A-0 for installation in the tunnel."	"The point scan and single stretched wire measurements of ILP001 have been completed according to checklist #..., and the data is being analyzed by Dave Harding to determine a disposition."
7.	***Data analyzed and disposition given*** . The data may be analyzed by a Physicist, or a specification may be provided to the Technician beforehand.	A Physicist, if analyzed by him/her. A Technician, if specifications defined beforehand.	Status	"Ready to Use"; "Awaiting E&F Completion: unscheduled"; "Needs Evaluation: special reassessment"	A brief description of the results, and a disposition of the device. It would also be good to point to a file(s) that detail the measurements.		"The measurement data for ILP001 have been analyzed and it has been determined that this magnet has excellent harmonic performance. This device is now 'Ready to Use'."
8.	***Device shipped out of IB1*** .	Material Control, if moved by them. Technician if not moved by MC.	Location	"MSB"; "A-0"; "IB2"; "TPL"	Where the device was moved from and to, and its expected fate, if known.		"ILP001 was moved from IB1 to TPL for storage."

IB1 Flow of Devices and Data

Notes:

* It is not expected that there will be as many DSR entries as there are steps. By in large, there is a "doublet" of entries (examples given in the column 'Typical DSR statements').

* The first statement of the "doublet" declares that the device has arrived in IB1 and reports the measurements that are planned to be done.

* The second statement of the "doublet" declares that the measurement has been completed, the disposition of the device, where the device is being moved to, and its expected fate.

* Sometimes the disposition of the device does not occur in time sequence with the labor of the measurement, and so a third entry can be expected.

* Depending on the time delay between events and if the tasks are done by different people, the entries may be broken up (examples given in the column 'Other DSR entries').

IB2 Flow of Devices and Data

	What's happening to the device:	Who is responsible for the DSR update for this step:	Keywords to be updated:	Typical keyword values:	Information expected in DSR:	Typical DSR statements:	Other DSR statements:
1.	***Device is chosen to be looked at in IB2*** . Device chosen because of new construction, repair/upgrade, or due to special needs.	Production Supervisor	Status	"Awaiting E&F Completion: not scheduled"	The reason that this device is being looked at.		"IQC023 is being sent to IB2 to be inspected to confirm or deny that it has a hipot failure." or "TSD291 is to be upgraded with a recooler."
2.	***Device arrives at IB2*** .	Material Control, if moved by them. Production Supervisor if not moved by MC.	Location	"IB2"	Where the device was moved from and to.		"TSD291 was moved from MSB to IB2."
3.	***Device inspected*** .	ProEng Technician	N/A	N/A	The device went through incoming inspection - only if there is a time delay between inspection and the work starting.		"IQC029 failed hipot and leak check. A decision is to be made by Dave Harding, et al, regarding the future of this device."
4.	***Device chosen to be worked on.*** The incoming inspection usually determines whether or not a device will be worked on at this time.	Production Supervisor, if the work is part of a normal production process, otherwise a Physicist.	Status	"Awaiting E&F Completion: scheduled"	The device has been placed on the current job list.		"IQC023 will be salvaged and rebuilt with a new serial number."
5.	***Work plan defined*** . This may be a "special" plan for a small number of magnets, or it may be defined as part of the normal production process. The plan needs to be defined before the work can begin.	Production Supervisor, if the work is part of a normal production process, otherwise a Physicist. Could be ProEng for new construction.	N/A	N/A	What work is expected to be done.		"Parts and travelers have been issued to production for the new construction of magnet ILA017."
6a.	***Work started*** .	Production Supervisor	Status	"Awaiting E&F Completion: in process"	The work has started - only if this will be a prolonged effort.	"TSD291 has arrived in IB2 from MSB. It is to be retrofitted with a recooler according to print ME-291300 and traveler TR-333406. It is expected to become TSDR291 after the work is complete."	"The salvage work on IQC023 has started and is expected to take about 1 month to complete, at which point we will begin to contruct the "new" magnet IQC039."
6b.	***Serial Number Change.*** Add the new S/N to the AKA Serial Number field.	Process Engineering	AKA S/N		Expected new S/N.		The new S/N EDBB010 has been assigned to this device.
7a.	***Work finished*** . Work on the device is completed; this includes all electrical/flow/leak testing. A disposition is assigned to the device, based on the results of the work and inspections.	Production Supervisor	Status; Rework/Mod	"Ready to Use"; "Awaiting D&T Completion: unscheduled". Example for Rework/Mod "Upgrade correction coil lead stack MB-351860".	A brief description of the results, and a disposition of the device. It would also be good to point to traveler(s) used.	"The device TSD291 has been retrofitted with a recooler according to print ME-291300 and traveler TR-333406. It has passed all electrical and flow testing, and has been renamed TSDR291. This device is being sent to IB1 for realignment."	"Contruction of device IQC039 has been completed according to print ME-274650 and traveler TR-318965. It has passed all electrical and flow testing."
7b.	***Serial Number Change.*** Add the new S/N to the Serial Number field and change the DSR header.	Process Engineering	S/N		New S/N.		
8.	***Device shipped out of IB2*** .	Material Control, if moved by them. Production Supervisor if not moved by MC.	Location	"MSB"; "A-0"; "IB1"; "TPL"	Where the device was moved from and to, and its expected fate, if known.		"IQC039 was moved from IB2 to MSB for measurement."

IB2 Flow of Devices and Data

Notes:

* It is not expected that there will be as many DSR entries as there are steps. By in large, there is a "doublet" of entries (examples given in the column 'Typical DSR statements').

* The first statement of the "doublet" declares that the device has arrived in IB2 and reports the work that is planned to be done.

* The second statement of the "doublet" declares that the work and inspection have been completed, the disposition of the device, where the device is being moved to, and its expected fate.

* Depending on the time delay between events and if the tasks are done by different people, the entries may be broken up (examples given in the column 'Other DSR entries').

* New "Rework/Mod" keywords should be reviewed by ProEng for consistency prior to use.

* Issues to handle when a device is to have a prefix changed (e.g. TSD to TSDR or an FRD# to EDBB):

  - When the kits and travelers are issued by Process Engineering, PE will add the assigned new S/N to the AKA Serial Number keyword. The serial number (both the keyword and in the header of the DSR) will not be changed at this point.

  - When the work on the device is complete (including inspections), PE will change the serial number keyword and the DSR header. This should coincide with PE receiving the completed traveler immediately after the "silver sticker" as affixed to the device.

  - New serial numbers assigned to devices that never are completed (e.g. EDBB010) are not to be reassigned to another device.

* Our practice is to create a DSR for every device that TD touches. This will include devices with old serial numbers (e.g. FRD #'s). We will add the appropriate "magnet series" in the OnBase keywords, even though the device may not ever receive an upgrade. For example, all 6-3-120 magnets will have the series "SDFB" added to the "Magnet Series" keyword, even though some magnets may never be assigned a new serial number with an SDFB prefix.